Comprehensive Course Syllabus

BC Calculus 1

Course Description:

BC Calculus I is the first of a three-semester sequence designed to give a solid introduction to the study of Calculus. Students must have successfully completed MI-4, or its equivalent. The semester includes an intuitive approach to the rate of change of a function, limits, the definition of the derivative, and techniques for finding derivatives of various functions. Throughout the semester, students will also study a variety of applications of the derivative including many properties of functions, max/min problems, growth, and differential equations.

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INSTRUCTOR(S):

- Name(s): Ruth Dover, Dennis Loo, Richard Stalmack
- Office Number(s) : A-157.
- Telephone number(s): x5968, x5480, x5481
- Email addresses: dover@imsa.edu, dloo@imsa.edu, rstalma@imsa.edu

Meeting Days, Time and Room(s)
Section 1 (Stalmack): A152, 8:00
Section 2 (Stalmack): A152, 10:00
Section 3 (Loo): A155, 11:00
Section 4 (Dover): A151, 1:20
Section 5 (Loo): A152, 3:20

Text(s) / Materials:
Hughes-Hallett, D. , Gleason, A., McCallum, W. et al. (2009). *Calculus 5th Ed.*, John Wiley & Sons, Inc. ISBN 078-0470-13159-6.
Chapters 1 - 3, selected sections of Chapter 4, supplemental materials written by members of the IMSA Math Team.
Students are required to have a graphing calculator. TI-89 Titanium is recommended.
Students will also use *Mathematica,* and various internet resources via their laptops

Essential Content:

BC Calculus 1: Chapters 1 – 3, some of 4

Days	Content
1 – 10	Sections 1.1 – 1.6: Review – mostly. Worksheets: Startup 1, 2, 3 (review)
5 – 10 (overlapping)	Worksheets: Rate of Change and Euler Basic relationships between position and velocity graphs, moving in both directions. Introduce Euler's Method (where $y' = f(x)$ only) to help connect the graphs of y and y' and to introduce the importance of step size and approximations.
11 – 17	Sections 1.7 – 1.8: Intro to continuity and limits. Intermediate Value Theorem. Worksheets for extra work on limits. Use graphs, algebra, tables, and intuition for limits as $x \to a$, as $x \to \infty$, and limits that approach ∞. Asymptotes. One-sided limits and continuity for various functions. Introduction to δ - ε definition.
18 – 21	Sections 2.1 – 2.2: Measuring speed and definition of a derivative. Average rate of change vs. instantaneous rate of change. Local linearity and tangent lines. Using calculator for exploration and worksheet using calculator to observe derivative functions.
22 – 31	Sections 2.3 – 2.6: Meaning of the derivative, derivative function, second derivative and concavity. Intro to geometry of derivatives with f, f', and f'' with extra worksheets. If differentiable, then continuous.
32 – 40	Section 3.1 – 3.4: Rules for power functions, exponential functions (worksheet). Product, quotient, and chain rules.
41 – 43	Sections 3.5: Trig limits (with worksheet) and derivatives of trig functions. Extra worksheet.
44 – 53	Sections 3.6 – 3.7, 4.6: Derivatives of inverse functions, including the natural log and inverse trig functions. Implicitly defined functions and derivatives. Intro to Related Rates. Extra worksheets.
54 – 57	Sections 3.9 – 3.10: Linear approximations, Mean Value Theorem, more theorems.
58 – 63	Section 4.1 – 4.2: More on geometry of derivatives. Intro to optimization. Extreme Value Theorem.
64 – 66	Semester Review

Instructional Design and Approach:

Class time will regularly involve collaboration, investigation, and communication. Collaboration encourages discussion between students who are enthusiastic about learning; they share ideas amongst themselves from multiple perspectives, which in turn, encourages students to construct their own understanding. Investigation includes the frequent use of technology to help forge connections between different representations, which promote a deeper understanding of concepts. Students are encouraged to think independently and draw upon experiences from other classes as a natural part of the investigative process. Students are expected to delve deeply into content, forming rigorous and broad connections within and among concepts. Communication is the tie that binds collaboration and investigation. It allows students to work together and share ideas, allows the teacher to assess and to push students further, and it helps students to monitor their own understanding.

Student Expectations:

In-class work. This will take the form of worksheets or problems assigned from your text or other sources. This work will often form the basis for upcoming explorations, discussions, and homework. It needs to be completed in a timely manner, usually by the beginning of the next class period, with portions being completed immediately when assigned.

Homework. You can expect to be given homework assignments most every evening. These will include problems and reading assignments from the textbook and need to be completed by the beginning of the next class period. Though I will not collect all the homework assignments, I will collect them on a number of occasions. In addition, every ten days to two weeks, you can expect a longer homework assignment, now called "Take-Homes." These will typically be due one week from the day they are assigned. If a homework assignment is turned in late, then you can expect anywhere from a 10% to 50% reduction in points, based upon just how late the assignment is turned in.

Quizzes. These will be given as I deem necessary. They

- will usually be short (15-25 minutes),
- may occur as frequently as twice a week or as infrequently as every other week,
- may or may not involve the use of a graphing calculator,

Exams/Tests/"Big" Quizzes. These will be announced well ahead of time and will typically occur at the end of a unit or after a major concept or related major concepts have been covered.

Assessment Practices, Procedures, and Processes:

Grading policy:
Important: Anything that will receive a grade will be announced in advance.

Quarter grade:	75% from Tests and Quizzes 25% from Homework, Take Homes, Written Assignments, etc.
Semester grade:	80% from cumulative semester work 20% from the semester final exam

Assignments handed in after their due date should expect to lose points, depending upon the assignment and how late the work is done.

Grading scale:

A - 90% or above
B - 80% or above but less than 90%
C - 70% or above but less than 80%
D - less than 70%